8.0 CLOSURE COST ESTIMATE

8.1 Background

The surface impoundment closure cost estimate is based on removing sludge and contaminated soil, dewatering the sludge, and disposing of dewatered sludge and soil in a hazardous waste landfill. Pursuant to USEPA Guidance documents on preparing closure cost estimates, the criteria used in preparing this estimate are conservative.

One of the key conservative assumptions is that the sludge will be dewatered to only 30% solids. Vendor treatability studies and the actual field work on the 1992 impoundment cleanout indicates that it may be possible to produce a pressed cake with a higher solids content. Using a lower solids content produces a conservative cost estimate because it results in an increase in pressed cake tonnage which increases both the dewatering cost and landfill disposal cost. In addition, the landfill cost used is a current contract number, but can likely be reduced with negotiation. The effect of these conservative assumptions is to artificially inflate the projected cost for closure. Should more cost effective sludge processing technology be identified, BP will use the lesser cost technology. This makes the cost estimate yet again conservative.

Based on the above, the cost to close the MHR surface impoundment is estimated to be $2.8 million in 1993 dollars. The references used in developing this estimate include:

1. Vendor Budget Estimates - For areas such as sludge dewatering, budget cost information was collected from vendors.

2. Plant Experience - Some of the cost information was provided by MHR project engineering personnel. Due to the fact that many costs are site-specific, it was determined to be more accurate to use plant experience when available rather than text reference material.

3. Guidance Manual: Cost Estimates for Closure & Post Closure Plans, Vol. III, Unit Costs, Nov. 1986 by US EPA - Unit costs were found here for areas such as sludge removal.

4. Survey of Current Business - Used to determine the GNP implicit price deflators in order to escalate costs where required.

8.2 Cost Estimate Summary

The cost estimate summary (Figure 8-1) shows the categories and subcategories considered in the development of the cost estimate. A 15% contingency has been included on the bottom line to account for unforeseen expenditures. The estimated total costs are $2.8 million. The major cost components of this estimate are sludge removal and dewatering which contributes $395,000, sludge disposal which contributes $585,000, and soil disposal which contributes $737,000.

8.3 Key Assumptions and Calculations

8.3.1 Key Assumptions

One key assumption, the volume of sludge and emulsion contained in the SI was determined by a detailed calculations using actual impoundment top dimensions and then calculating volumes of various cross-sections of the impoundment. The actual depth of the free water, emulsion, and sludge are based on the BPR March 1993 detailed impoundment sampling. This provided the volumes of the sludge and emulsion as shown in Figure 8-2. Using the measured specific gravity of these layers, an estimate of the tonnage was developed. The key assumptions that form the basis of the cost estimate are shown in the Key Calculation Assumptions worksheet (Figure 8-3). In addition, backup information is provided in three Appendices: the Engineering Calculations (Appendix H); and the Vendor Budget Cost Information (Appendix I), and USEPA Worksheets Volume II of the Cost Guidance Manual (Appendix K).

8.3.2 Calculations

The calculations that result in the final costs are tabulated in the Impoundment Closure Calculations and Cost Detail tables in Figure 8-3. This information contains the mass balance information pertaining to sludge dewatering, as well as the details of the cost categories. Even though oil may be recovered in some of the processing steps, such as dewatering of the sludge, in line with the conservative estimation, no credit is included in the calculations.

8.4 Cost Components of the Estimate

The cost components of the estimate are discussed below:

1. Free Oil Recovery - A cost allowance is included in the event that the free oil on the top of the impoundment could be skimmed off and recovered. Under current conditions it is not technologically nor economically feasible to remove the thin film of oil. However to maintain the conservative nature of the cost estimate the small cost component of $1,000 was included.

2. Free Standing Liquid Removal and Treatment - The 1,069,000 gallons of free standing water is assumed to be removed by a third party contractor at an estimated cost of $11,000. The treatment of the water is assumed to be in the advanced waste water treatment plant (AWWTP) located on-site. The cost of treating wastewater, $.09 per gallon, is based on an in-house BP study of the incremental costs associated with increased flows to the AWWTP. Although this cost will be absorbed by the refinery as an on going operating cost, the treatment cost, estimated as $96,200, is included.

3. Emulsion Treatment - This step, a pretreatment step, would separate oil (recycle) and water (treatment) from an emulsion layer. The remaining sludge solids would be processed with the other SI sludge solids. These emulsion treatment costs were provided by a vendor and the equipment, chemicals and removal costs are estimated to be $43,000. It is likely that this step will not be feasible and thus an additional conservative factor is added.

4. Sludge Removal/Dewatering - Sludge removal and dewatering is a significant category accounting for $395,000 of the total cost estimate. The most costly component of this step is the dewatering process fee, based on vendor information. Vendors who conducted treatability testing on MHR sludge samples provided a budget cost number of $120/ton to dewater sludge to a 30% dry solids cake. A processing cost of $322,000 was derived from an estimate of a 2,684 tons of filter cake The remaining cost of $73,000 includes the sub-categories; power, mob/demob fee, additives, site prep, and job monitoring.

5. Dewatered Sludge Treatment/Disposal - The total cost estimate for this category is $585,000. The loading/handling of the sludge and a lab /hazardous characterization fee is estimated to equal $19,000. The disposal of the sludge is to a hazardous waste landfill. Transportation of $58/ton is based on actual refinery experience. Transportation of the 2,684 tons of sludge will cost

$156,000. The landfill disposal at $153/ton is based on current contractual information and results in a cost of $411,000. This is a conservative assumption as landfill rates are declining.

6. Soil/Liner Removal - In this estimate removal of the soil and liner is considered one cost component. The total cost for removal is estimated to be $43,000.

7. Soil/Liner Treatment & Disposal - The disposal of the soil/liner is to the hazardous waste landfill, consistent with the sludge, and with the same unit costs. The tons of soil exceed the tons of sludge, resulting in this being the most significant one cost category at a cost of $737,000.

8. Remove/Dispose of Structures, etc. - This category includes the cleaning of structures and pipes in the impoundment. These costs are based on plant experience. This cost is estimated at $94,000.

9. Backfill the Hole - In this estimate, the hole is partially filled at a cost of $149,000. A cost of $10,000 is included to provide for new pipe and a new sump for surface water control. The remaining $139,000 is to haul and place dirt. A unit cost of $9/ton is from recent refinery experience.

10. Internal Engineering Costs - An in-house estimate of internal engineering costs indicate a cost of $40,000. These costs including project management, contractor oversight and corporate technical support are based on site experience.

11. Outside Engineering Costs - Total outside engineering costs of $160,000 are estimated. These costs would include closure design, closure certification, project management, closure report preparation, sampling and analysis, and risk assessment if needed.

12. Contingency - A 15% contingency has been included.

Figure 8-1 Cost Estimate Summary

COST ESTIMATE SUMMARY
SURFACE IMPOUNDMENT CLOSURE

	Itemized	Subtotals
FREE OIL RECOVERY		$1,000
FREE STANDING LIQ. REMOVE AND TREAT		
Mobilize/Demobilize	$5,000	
Liquid Removal	$6,298	
Treatment/Process On site WWT Plant	$96,253	
		$107,551
EMULSION REMOVAL AND TREATMENT		
Removal Cost	$13,821	
Equipment Rental Cost	$10,000	
Chemicals Cost	$14,533	
Other	$5,000	
		$43,386
SLUDGE REMOVAL/ DEWATERING		
Mobilize/Demobilize Fee	$11,000	
Power	$14,066	
Additives	$23,320	
Dewatering Process Charge	$322,130	
Site Prep	$20,000	
Job Monitoring/Analytical	$5,000	
		$395,516
SLUDGE TREATMENT/DISPOSAL		
Lab Fee/Haz Charact.	$5,500	
Loading/Handling	$13,422	
Transportation	$155,696	
Landfill Fee	$410,716	
		$585,334
SOIL/LINER REMOVAL		
Mobilize/Demobilize Fee	$2,270	
Excavate/Load	$40,614	
		$42,884
SOIL/LINER TREATMENT/DISPOSAL		
Lab Fee/Haz Charact.	$5,500	
Loading/Handling	$16,923	
Transportation	$196,301	
Landfill Fee	$517,829	
		$736,553

Figure 8-1 Cost Estimate Summary

REMOVE/DISPOSE STRUCT.,RIP/RAP,ETC		
Structures, remove and haul	$400	
Clean Structures and Pipes	$15,550	
Rip Rap wash	$0	
Landfill Rip Rap	$77,718	
		$93,668
BACKFILL THE HOLE		
New Pipe and Sump	$10,000	
Haul and Place Dirt	$139,271	
		$149,271
INTERNAL ENGINEERING COSTS		$40,000
OUTSIDE ENGINEERING COSTS		
Closure Design	$10,000	
Closure Certification	$10,000	
Project Mgmt	$30,000	
Closure Report	$25,000	
Sampling & Analysis	$55,000	
Risk Assessment	$30,000	
		$160,000
SUBTOTAL		$2,355,163
CONTINGENCY @ 20%		$471,033
TOTAL COSTS		$2,826,196

Figure 8-2 SI Characterization Data

POND CHARACTERISTIC DATA

REFINERY LOCATION	MARCUS HOOK REFINERY
POND NAME	IMPOUNDMENT POND
TREATMENT OPTION	REMOVE WASTE-DISPOSE IN LANDFILL

IMPOUNDMENT TOP SURFACE AREA

Ft2	99,900
Yd2	11,100
Acre	2.3

Normalized Rectangular Dimensions

Length Ft.	360
Width Ft.	277.5
Slope Top Width	4 /1
Slope Btm Width	4 /1
Slope Rt Length	3 /1
Slope Lft Length	4 /1
Pond Depth,ft, Top of Berm to Sludge Btm	11 (per C.F.)

	VOLUME, FT3
FREEBOARD	480,863
WATER	142,949
EMULSION	90,729
SLUDGE	122,433
SOIL	27,268

Freeboard	Volume , Ft3		480,863					
5.5	Depth, FT	Yd3	17,810					
87,430	Area ,FT2	Gal	3,597,569					
		Bbl	85,656					
Free Oil Layer		Gal	4,000					
(Layer Depth not Consistent, Vol. Estimated from Sampling)								
Free Standing Water Layer	Volume , Ft3		142,949	Specific Gravity *	1.00	FS Water	%	TONS
2	Depth, FT	Yd3	5,294	Lbs	8,908,708	S	0.05	
71,475	Area ,FT2	Gal	1,069,473	Tons	4,454	O	0.5	
		Bbl	25,464			W	99.45	4,4
Emulsion Layer	Volume , Ft3		90,729	Specific Gravity *	0.98	Emulsion	%	TONS
1.4	Depth, FT	Yd3	3,360	Lbs	5,541,226	S	8.49	2
64,807	Area ,FT2	Gal	678,789	Tons	2,771	O	9.3	2
		Bbl	16,162			W	82.21	2,2
Sludge Layer	Volume , Ft3		122,434	Specific Gravity *	1.06	Sludge	%	TONS
2.1	Depth, FT	Yd3	4,535	Lbs	8,087,963	S	11.5	4
58,302	Area ,FT2	Gal	915,985	Tons	4,044	O	13.97	6
		Bbl	21,809			W	74.53	3,0
Soil/Lining LayerPond Btm	Volume , Ft3		27,268	Specific Gravity *	1.95	Soil/Liner	%	TONS
0.5	Depth, FT	Yd3	1,010	Lbs	3,313,756	S	55	9
54,536	Area ,FT2	Gal	204,005	Tons	1,657	O	0	
		Bbl				W	45	7
Soil/Gravel - Pond Sides	Volume , Ft3		27,439	Specific Gravity *	2.24	Soil/Liner	%	TONS
0.5	Depth, FT	Yd3	1,016	Lbs	3,830,409	S	100	1,9
54,878	Area ,FT2	Gal	205,283	Tons	1,915	O	0	
		Bbl				W	0	
Groundwater		Gal	50,000	* NOTE-Specific Gravity is Important Since Tonnage is Based on That Value!				
Rip Rap Vol.		Ft3	5850					

Recovered Oil Credit $/Bbl			0
Oil Specific Gravity	0.95	LB/BBL	332
Heat of Combustion-Oil (Btu/lb)			20,000
Heat of Combustion-Solids (Btu/lb)			2,900
Heat of Combustion-Insitu Sludge Layer (Btu/lb)-CALC No.			3,128
Heat of Combustion-Soil/Lining Layer (Btu/lb)			2,700

Figure 8-3 Key Calculation Assumptions

KEY CALCULATION ASSUMPTIONS

SOURCE OF DATA				
	FREE OIL RECOVERY			
	Oil Recovery %		95	
	Cost Incurred $		1,000	
	FREE-STANDING WATER REMOVAL and TREATMENT			
WWT Limits flow to 150 gpm	Pumping Rate (gpm)		150	
	Mobilize/Demob Fee $		5000	
Pg. 4-4 Ref #1-5.92/100 gal	Liquid Removal Fee $/hr		53	
	Treatmt/Process Option		On Site WWT Plant	
In-House Data	Treatmt/Process Fee $/gal		0.09	
	EMULSION REMOVAL AND TREATMENT			
	Emulsion Treatment Option		CHEMICAL	
Pg. 4-5 Ref #1	Removal Cost $/ton		5	
Allowance	Equipment Rental $		10000	
Vendor-Chemlink	Chemicals Cost $/ 1000 gallon emulsion in		21.41	
Allowance	Other Cost $		5000	
	Sludge Out			
Vendor-Chemlink	Solids %		15	
	Oil %		4	
	Removed Water- Treatment Method		WWT	
In-House Data	Water Treat Cost $/gal		0.09	
	Sludge is Disposed via Options Selected for Sludge Layer			
	SLUDGE REMOVAL AND DEWATERING			
	Note- Costs Include Removal and Dewatering			
	Dewatering Alternative		FILTER PRESS	
Vendor-Bird	Mobilize/Demobilize Fee$		11,000	
Vendor-Bird	Process Charge $/ton cake		120	
	Liquid Additives			
	Additive #1	Ferric Chloride		
Vendor-Bird		% of Dry Tons	3%	
Vendor-Bird		Cost-$/ton	360	
	Additive #2	Liquid Additive b		
		Gal/Ton sludge	0	
		Cost-$/Gal	0	
	Solide Additives			
	Additive #3	Pre Cost		
		Ton/Ton sludge	0	
		Cost-$/Ton	0	
		Btu/lb	0	
	Additive #4	Lime		
Vendor-Bird		% of Dry Tons	15%	
Vendor-Bird		Cost-$/ton	150	
		Btu/lb	3	
Plant Experience	Site Prep-Slabs, Containment, Utilities $		20,000	
Allowance	Job Monitoring/Analysis $		5,000	
Vendor-Bird	Dewatered Sludge	Solids %	30	
Vendor-Bird	Composition wt%	Oil %	15	Vendor-Bird
	Power Cost $/kwh	0.05	Power Required KWH	281,323 94 dys * 480v* 150 a* 1.732

Figure 8-3 Key Calculation Assumptions

SOURCE OF DATA	ASSUMPTIONS		
	SLUDGE DRYING NOT INCLUDED		0
	DRYING OF SLUDGE		
	Treatment		Lo. Temp Drying
	Mobilize/Demobilize Fee $		0
	Load/Haul to Dryer $/ton		0
	Process Charge $/ton in		0
	Power KWH		0
	Dried Sludge Composition-Wt. %		
		Solids %	70
		Oil%	15
	SLUDGE TREATMENT/DISPOSAL		
	LANDFILL DISPOSAL		
	Landfill Site	Ohio Landfill	
Current Plant No.	Transportation $/ton	58	
Current Contract-Vendor	Landfill Fee$/ton	153	
Allowance	Lab Fee $	2,500	
3 Samples@$900ea	Haz. Charact. $	3,000	
Same as Sludge Removal	Loading/Handling $/ton	5	
2 Dump Truck, 1 FE Loader- Pg. 6-3 Ref #1	**SOIL/ LINER REMOVAL**		
	Mobilize/Demob Fee $		2,270
Pg. 6-3 Ref #1	Standby Charge $		0
Terex Data Book	Excavate/Load Cost $/TON		12
	Expansion Factor		1.43
	Note- The Expansion Factor accounts for the fact that when soild is disturbed from its natural state it fluffs or swells.		
	SOIL/LINER TREATMENT		
	LANDFILL DISPOSAL		
All Nos. Same as SLudge TReatment	Landfill Site	Ohio Landfill	
	Loading/Handling $/ton	5	
Current Plant No.	Transportation $/ton	58	
Current Contract-Vendor	Landfill Fee$/ton	153	
Allowance	Lab Fee $	2,500	
3 Samples@$900ea	Haz. Charact. $	3,000	
Same as Sludge Removal			
	ASSUMPTIONS		
SOURCE OF DATA			
	GROUNDWATER TREATMENT		
	Mobilize/Demob Fee$		0
	Treatment Option		NOT REQUIRED
	Treatment Cost $/Gal		0
	RIP RAP, PIPES, AND STRUCTURES REMOVAL AND CLEAN/DISPOSE		

Figure 8-3 Key Calculation Assumptions

Plant Site Experience	Pond Structures Weight,Tons	50
Plant Site Experience	Structures, removal and Haul $/ton	8
Plant Site Experience	Clean Structures $	$3,750
Plant Site Experience	Clean Pipes	$11,800
Plant Site Experience	Rip Rap Wash $/yd3	0
Same as Sludge	Haz.Landfill Rip Rap.$/ton -SAME COST AS SLUDGE	21.1
Terex Data Book	Rip Rap Density -bank lb/yd3	3400
	BACKFILL THE HOLE	
	Mobilize/Demob Fee$	$10,000
Plant Site Experience	Supply/Place Fill Mtl $/yd3	9.06
Calculated	Clean Close-Partial Fill Vol ,Yd3	13367
	POST CLOSURE CARE	
		Clean Closure
		NO MONITORING
	Annual Cost $	0 Total Annual Cost
	CAP Inspection $/yr	0 0
	Qtry/Annual reporting $/yr	0
	Well Maint. & Replacement $/yr over 30 yr	0
	Discount Factor %	0
	INTERNAL ENGINEERING COSTS	Clean Closure-Treat & Dispose Offsite
Plant Experience	In-Plant Support	20,000
	Corp. Support	20,000
	OUTSIDE ENGINEERING COSTS	Clean Closure-Treat & Dispose Offsite
Engineering costs estimated by project team	Closure Design	10,000
	Closure Certification	10,000
	Project Mgmt	30,000
	Closure Report	25,000
	Sampling & Analysis	55,000
	Risk Assessment	30,000

Figure 8-4 SI Closure Calcuations Cost Details

POND CLOSURE CALCULATIONS & COST DETAILS

1993 $

MARCUS HOOK REFINERY
IMPOUNDMENT POND

Oil Bbl.	95	*FREE OIL RECOVERY*		
		Oil Recovery Costs		1,000
		Oil Recovery Credit		0
			Subtotal after Oil Recovery Credit	
		FREE-STANDING WATER REMOVAL and TREATMENT		
		Mobilize/Demobilize		$5,000
		Liquid Removal	119 Hrs	$6,298
		Treatment/Process	On Site WWT Plant	$96,253
		Subtotal		$107,551

EMULSION REMOVAL AND TREATMENT

Emulsion Mass Balance	
Emulsion In (Tons)	2,771
Oil	257.7
Solids	235.2
Emulsion Sludge Out (Tons)	1668.2
Oil	82.7
Solids	235.2
Water	1270.2
Oil Recovered (Bbl)	1,173

Treatment Option	CHEMICAL
Removal Cost	$13,853
Equipment Rental Cost	$10,000
Other Costs	$5,000
Chemicals Cost	$14,533
Subtotal Before Oil Credit	$43,386
Oil Recovery Credit	$0
Subtotal After Oil Credit	$43,386

SLUDGE REMOVAL AND DEWATERING

Note-Costs Include Removal and Dewatering

Sludge Mass Balance	Emulsion Layer	plus	Sludge Layer	Total
Sludge Tons In	1,668.2		4,044.0	5,812.1
Oil	82.7		564.9	627.7
Solids	235.2		465.1	700.3
Water	1,270.2		3,014.0	4,284.2
Additive-Precoat				0.0
Additive-Lime				105.0
Sludge Tons Out(Cake)				2,684.4
Oil				402.7
Solids -Incl. Additives				805.3
Water				1,476.4
Oil Recovered (Bbl)				1,354
Sludge In (Btu/lb)				2,599
Dwtr Sludge Out (Btu/lb)				3,757

	FILTER PRESS
Dewatering Option	
Mobilize/Demob. Fee	$11,000
Power	$14,066
Additive Cost	
Ferric Chloride	$7,563
Liquid Additive b	$0
Pre Coat	$0
Lime	$15,756
Dewatering Process Charge	$322,130
Site Prep-Slabs,Contain., Utilities	$20,000
Job Monitoring/Analytical	$5,000
Subtotal Before Oil Credit	$395,516
Oil Recovery Credit	$0
Subtotal After Oil Credit	$395,516

Figure 8-4 SI Closure Calcuations Cost Details

POND CLOSURE CALCULATIONS & COST DETAILS

DRYING OF SLUDGE — **NOT INCLUDED HERE**

Sludge Mass Balance	
Sludge Tons(Cake) In	2,684.4
Oil	402.7
Solids	805.3
Sludge Tons(Cake) Out	2,684.4
Oil	402.7
Solids	805.3
Oil Recovered (Bbl)	0
BTU Content	
Dwtr Sludge (Btu/lb)	3,757
Dried Sludge (Btu/lb)	3,757

Treatment	Lo. Temp Drying
Mobilize/Demobilize	$0
Load/Haul to Dryer	$0
Process Charge	$0
Power	$0
Subtotal Before Oil Credit	$0
Oil Recovery Credit	0
Subtotal	$0

SLUDGE TREATMENT/DISPOSAL

LANDFILL		
Pressed /Dried Tons		2,684
Landfill Site	Ohio Landfill	
Lab Fee		$2,500
Haz. Charact.		$3,000
Loading/Handling		$13,422
Transportation		$155,696
Landfill Fee		$410,716
Subtotal		$585,334

SOIL/ LINER REMOVAL

	Soil/Liner Volume from Pond Btm	Soil/Rock Volume from Pond Sides		
Liner Volume In Pond, Yd3	1,010	1,016	Mobilize/Demobilize	$2,270
Liner Volume, Out, Yd3	1,444	1,453	Standy Charge	$0
Liner/Soil, Tons	1,667	1,728	Excavate/Load	$40,614
		To Haz. Waste Landfill w/ riprap	Subtotal	$42,884

SOIL/LINER TREATMENT

LANDFILL DISPOSAL		
Soil, Tons		3,385
Landfill Site	Ohio Landfill	
Lab Fee		$2,500
Haz. Charact.		$3,000
Transportation		$196,301
Loading/Handling		$16,923
Landfill Fee		$517,829
Subtotal		$736,553

Figure 8-4 SI Closure Calcuations Cost Details

POND CLOSURE CALCULATIONS & COST DETAILS

GROUNDWATER TREATMENT

Treatment Option	NOT REQUIRED	
Mobilize/Demob. Fee		$0
Treatment Cost		$0
Subtotal.		$0

RIP RAP, PIPES, AND STRUCTURES REMOVAL AND CLEAN/DISPOSE

Structures, removal and Haul	$400
Clean Structures	$3,750
Clean Pipes	$11,800
Rip Rap Wash	$0
Landfill Rip Rap $/ton	$77,718
Subtotal	$93,668

BACKFILL THE HOLE

		Partial Fill For Clean Closure
Mobilize/Demob Fee	(Pipe & Sump - Cln Close)	$10,000
Partial Fill	Supply/Place Fill Mtl.	$121,105
Soil/Liner Volume	Supply/Place Fill Mtl.	$0
Sludge Volume	Supply/Place Fill Mtl.	$0
Emulsion Volume	Supply/Place Fill Mtl.	$0
Ret. Sludge + Add. Volume	Supply/Place Fill Mtl.	$0
Free Water Volume	Supply/Place Fill Mtl.	$0
Freeboard Volume	Supply/Place Fill Mtl.	$0
	subtotal	$131,105
	15% Shrinkage Factor	$149,271

Figure 8-4 SI Closure Calcuations Cost Details

POND CLOSURE CALCULATIONS & COST DETAILS

POST CLOSURE CARE

Discount Factor% = 0

	Clean Closure- P.V. One Year	30 Years
Annual Monitoring	$0	$0
Annual CAP Inspection	$0	$0
Qtrly/Annual Reporting	$0	$0
Other Monitoring	$0	$0
Subtotal	$0	$0

INTERNAL ENGINEERING

	Clean Closure-Treat & Dispose Offsite
Internal Support	$20,000
Corp. Support	$20,000
Subtotal	$40,000

OUTSIDE ENGINEERING

	Clean Closure-Treat & Dispose Offsite
Closure Design	$10,000
Closure Certification	$10,000
Project Mgmt	$30,000
Closure Report	$25,000
Sampling & Analysis	$55,000
Risk Assessment	$30,000
Subtotal	$160,000

DISCOUNT FACTOR % = 0

YEAR	DISC. FACTORS	SUMMATION
1	1.00	1.00
2	1.00	2.00
3	1.00	3.00
4	1.00	4.00
5	1.00	5.00
6	1.00	6.00
7	1.00	7.00
8	1.00	8.00
9	1.00	9.00
10	1.00	10.00
11	1.00	11.00
12	1.00	12.00
13	1.00	13.00
14	1.00	14.00
15	1.00	15.00
16	1.00	16.00
17	1.00	17.00
18	1.00	18.00
19	1.00	19.00
20	1.00	20.00
21	1.00	21.00
22	1.00	22.00
23	1.00	23.00
24	1.00	24.00
25	1.00	25.00
26	1.00	26.00
27	1.00	27.00
28	1.00	28.00
29	1.00	29.00
30	1.00	30.00